Alaska Department of Fish and Game

Prince William Sound Management Area

Data Report No. 6

Results of Gravel Incubator Experiments in Prince William Sound

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INTRODUCTION

In 1970 the first two gravel incubator boxes used in Prince William Sound were placed at Eccles Creek and Flemming Spit. During that first year the Eccles Creek box (seeded with hybrid chum-pink salmon eggs) froze out and the Flemming Spit box (which contained no eggs) functioned perfectly. Since then there have been two boxes installed along Eyak Lake, two more boxes installed at Flemming Spit and the box which froze out at Eccles Creek was moved to another nearby location.

The box at Eccles Creek has regularly frozen out for the past three winters and the two boxes along Eyak Lake have partially frozen out for the past two winters with the reason being due to an inadequate water supply. Further experiments with these boxes have been discontinued. The box at Flemming Spit produced about 70% green egg to fry pink salmon in 1972 and 1973. Due to the success of this box a half size box was installed at Flemming Spit in 1973 and seeded with green chum salmon eggs. Also, in 1973, the original box at Flemming Spit was seeded with green sockeye salmon eggs as were the two boxes along Eyak Lake.

Work during 1974 included the instalation of a third box at Flemming Spit using "Astro Turf" as a substrate and seeded with green sockeye eggs. Also, the half-size box at Flemming Spit was seeded with green pink salmon eggs.

The purpose of this report is to put down, in tabular form the results of two boxes at Flemming Spit and the two boxes along Eyak Lake in 1974.

METHODS AND MATERIALS

The gravel incubator boxes presently being used in Prince William Sound measure 4' X 4' X 8" and are fabricated from 3/4" exterior plywood and reinforced with 2" X 12" lumber. The incubator has a gravity fed water supply which originates from a 3' X 3' X 3' intake box (Figure 2) fabricated from perforated 3/4" exterior plywood. The intake box is buried and located about mid-stream and upstream from the incubator box and connected by a 2" P.V.C. intake line (Figure 2). Water passes through the intake box, into the intake line and enters the incubator box between the double perforated bottom and percolates upwards through alternating layers of gravel and eggs. Then, exits through the out fall hole located at the upper rear end of the box (Figure 1).

Adult salmon are seined in lake or creek (depending on species) and spawn is taken employing the "dry method" and not killing the fish prior to spawntaking to avoid the occurrance of blood in the spawn. After spawning operations are completed and the eggs have water hardened for a minimum of 30 minutes they are put into one gallon plastic containers and transported to the incubator site. This operation is carried out with a crew of two to five men depending upon the availability of personnel.

The Prince William Sound type incubator has a capacity of about 250,000 green eggs. The green eggs are alternated in layers with gravel (1/2" to 1 1/2" washed) with about 30,000 eggs per layer (Figure 1). When the number of eggs to reach the incubators capacity are not available in one days spawntaking it is spread over two or even three days within a five day period depositing the day's spawn in the incubator and covering with a layer of gravel. When the incubators capacity is reached an in-

sulated (2" styrene foam) plywood lid is fitted onto the box and nailed down.

The method of fry enumeration in the Spring and Summer employs the displacement method when the number of fry emerging is above 1,000. Below 1,000 the fry are counted individually. During the peak of the emergence fry are counted twice daily. Before and after the peak emergence the fry are counted daily or whenever enough are collected to make counting worthwhile.

The fry emerge from the incubator through the outfall hole and are collected in a "catcher box" which is an 18" X 18" X 36" box constructed from 3/4" exterior plywood with a series of 1" holes drilled horizontally across the end about 2" below the top to maintain the water level below the top of the box. Suspended inside the box on a 1/4" steel rod frame is a fiberglass screen*bag conforming to the inside dimensions. A lid consisting of 1/4" hardware cloth with a section cut out for the incubator outfall is then placed on top.

Following is the list of required equipment for enumerating and transporting the fry:

a. 1 short handled dip net with 5 1/2 X 8" frame.
b. 1 300 Ml. P.V.C. self leveling displacement cylinder.
c. 1 plastic dish pan
d. Small sample jars for length samples.
e. 1 tally counter
f. 4 five gallon "lock top" plastic buckets.
g. 1 Rite-in-the-Rain notebook.
h. 1 pocket thermometer.

* This bag will be constructed of 1/8" nylon bobbin netting in the future.

When the person counting fry arrives at the incubator he removes the catcher box lid and lifts the frame and bag up until it "dries" sufficiently to dip net the fry into the displacement cylinder and then into a "lock top" bucket tallying each cylinder as it is placed into a bucket. The bucket, after reaching capacity (about 5,000 fry), is then taken to the release site and the fry are released. Samples of fry number per 100 ml. are generally taken weekly and samples of fry length are taken at intervals throughout the emergence.

RESULTS

Results are given in Tables 1 through 9.

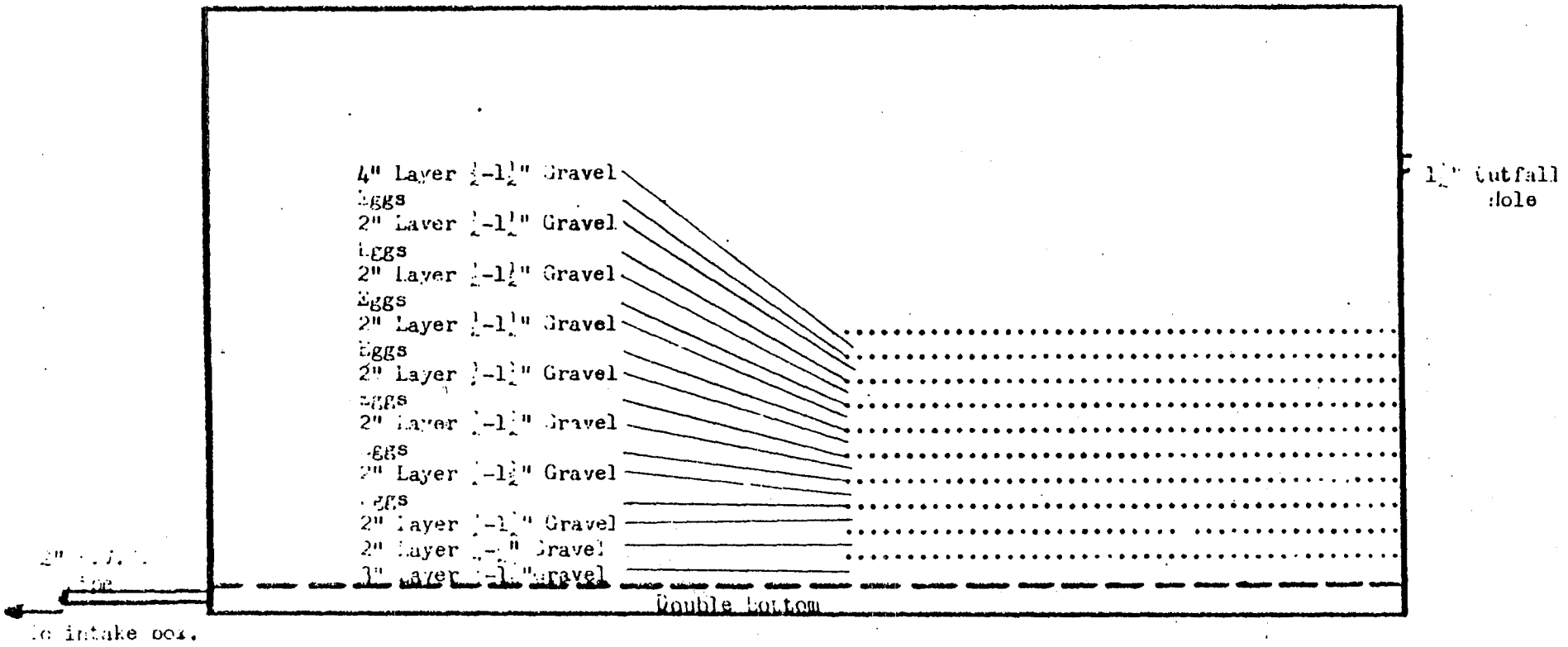

Figure 1. Diagram of incubator showing alternating layers of gravel and eggs.

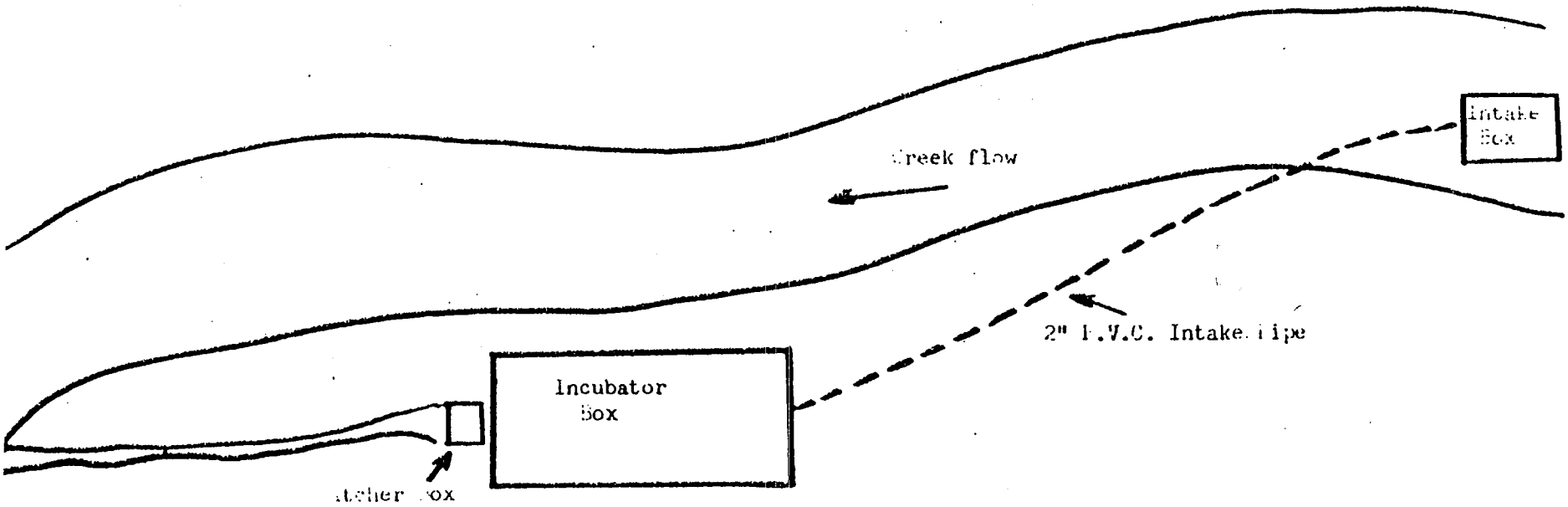
Intake Box
Creek flow
2" P.V.C. Intake Pipe
Incubator Box

Table 1. Chum salmon fry, Flemming Spit gravel incubator #2, 1974.

Date	Daily Count	Cumulative Total	Cumulative Percent	Stream Temp C°.
4/29	22	22	**	-
4/30	10	32	**	-
5/1	0	32	**	-
5/4	20	52	**	-
5/6	17	69	**	-
5/9	92	161	**	-
5/10	59	220	**	-
5/12	683	903	1	-
5/13	367	1,270	2	-
5/14	448	1,718	2	-
5/15	551	2,269	3	-
5/16	631	2,900	4	2
6/17	758	3,658	5	2
5/18	1,629	5,287	8	2
5/19	1,808	7,095	10	2
5/20	4,641	11,736	17	2
5/21	4,893	16,629	24	2
5/22	3,840	20,469	29	2
5/23	4,379	24,848	35	2
5/24	3,330	28,178	40	2.5
5/25	3,146	31,324	45	2
5/26	6,534	37,858	54	2
5/27	4,540	42,398	61	2
5/28	1,170	43,568	62	2
5/29	1,169	44,737	64	2.5
5/30	2,411	47,148	67	3
5/31	1,065	48,213	69	3
6/1	2,000	50,213	72	3
6/3	1,696	51,909	74	3
6/4	1,005	52,914	76	3
6/5	979	53,893	77	2.5
6/6	1,522	55,415	79	3
6/7	789	56,204	80	3
6/13	1,350	57,554	82	4
6/17	364	57,918	83	-
6/19	146	58,064	83	-
6/20	146	58,210	83	-
6/29	126	58,336	83	6.5
7/7	147	58,483	84	6.5
7/10	81	58,564	84	7.5
7/12	13	58,577	84	7.5
7/16	12	58,589	84	8

* These figures represent the results of 70,000 green eggs seeded into incubator box.
** Less than 1 percent.

Origin of spawn - Olsen Creek.
Destination of resultant fry - Flemming Spit.

Table 2. Chum salmon fry lengths, Flemming Spit Gravel incubator, 1974.

Date	Number in Sample	Average Length	Range	Total Length	Average Weight
5/13	100	38.5mm	35-42mm	3848mm	.44 gr.
5/16	203	38.7mm	36-42mm	7856mm	.41 gr.
5/20	99	38.5mm	36-41mm	3810mm	.46 gr.
5/28	100	37.3mm	35-40mm	3726mm	.36 gr.
6/4	100	37.8mm	35-42mm	3788mm	.40 gr.

1/ Measurement = tip of snout to fork of tail to the nearest millimeter.

Table 3. Chum salmon fry from Olsen Creek for comparison to incubator fry versus Wild fry, 1974.

Date	Sample Number	Time	Number in Sample	Average Length	Range	Total Length	Average Weight
5/15	1	2000-2100	31	39.8mm	38-42mm	1233mm	.42 gr. (14 fry)
5/15	2	2100-2200	40	38.6mm	36-41mm	1504mm	.40 gr. (40 fry)
5/15	3	2200-2300	44	38.4mm	37-42mm	1689mm	.46 gr. (10 fry)
5/15	4	2300-2400	42	38.3mm	36-41mm	1617mm	NA
5/16	5	0000-0100	40	38.3mm	36-41mm	1531mm	NA
5/16	6	0100-0200	40	38.5mm	35-41mm	1540mm	.43 gr. (5 fry)

Totals for fry samples from Olsen Creek for 5/15 and 5/16/74.

Number in Sample: 237

Average Length: 38.5mm

Range: 35-42mm

Total Length: 9114mm

Average Weight: .42 gr.

1/ Measurement = tip of snout to fork of tail to the nearest millimeter.

Table 4. Chum salmon fry lengths of gravel incubator hatched fry held in live pen 8 and 14 days, 1974.

Date	Days Held	Number in Sample	Average Length	Range	Total Length	Average Weight	Remarks
5/20	8	50	37.3mm	35-40mm	1863mm	.43 gr.	No Mortality Observed
5/28	14	51	37.7mm	35-40mm	1921mm	.38 gr.	No Mortality Observed

Table 5. Sockeye salmon fry, Flemming Spit gravel incubator #1, 1974*.

Date	Daily Count	Cumulative Total	Cumulative Percent	Stream Temp. C°
7/16	15	15	**	8
7/22	1,909	1,924	1	7.5
7/25	6,000	7,924	3	8
7/26	7,500	15,424	6	8.5
7/27	7,500	22,924	9	9
7/28	7,500	30,424	12	9
7/29	30,000	60,424	24	9
7/30	30,000	90,424	36	8.5
7/31	30,000	120,424	48	8.5
8/1	27,000	147,424	59	8.5
8/2	7,500	154,924	62	8.5
8/3	7,500	162,424	65	8.5
8/4	3,000	165,424	66	9
8/7	1,500	166,924	67	9
8/9	1,500	168,424	67	9
8/12	1,000	169,424	68	9
8/15	491	169,915	68	9.5

* These figures represent the results of 250,000 green eggs seeded into incubator box.

** Less than 1 percent.

Origin of spawn - Power Creek Arm, Eyak Lake.

Destination of resultant fry - West end Eyak lake in creek terminating at Chitina Air Service hanger.

Table 6. Sockeye salmon fry, Eyak Lake gravel incubator #1, 1974.*

Date	Daily Count	Cumulative Total	Cumulative Percent
6/26	2	2	**
6/29	1	3	**
7/9	13	16	**
7/10	1	17	**
7/11	5	22	**
7/12	1	23	**
7/13	15	38	**
7/14	80	118	**
7/15	1,888	2,006	1
7/16	11,825	13,831	5
7/17	25,542	39,373	16
7/18	29,326	68,699	27
7/19	14,190	82,889	33
7/20	4,257	87,146	34
7/21	2,938	89,984	36
7/22	7,095	97,079	38
7/25	946	98,025	39
7/26	1,419	99,444	39
7/27	2,838	102,282	40
7/29	1,419	103,701	41
8/3	1,419	105,120	42
8/8	1,000	106,120	42
8/19	200	106,320	42
8/28	175	106,495	42
9/6	28	106,523	42

* These figures represent the results of 253,000 green eggs seeded into incubator box.

** Less than 1 percent.

Origin of spawn - Power Creek Arm, Eyak Lake.

Desination of resultant fry - Power Creek Arm, Eyak Lake.

Table 7. Sockeye salmon fry, Eyak Lake gravel incubator #2, 1974.*

Date	Daily Count	Cumulative Total	Cumulative Percent
6/26	5	5	**
6/29	2	7	**
7/3	12	19	**
7/9	31	50	**
7/10	40	90	**
7/11	137	227	**
7/12	244	471	**
7/13	511	982	**
7/14	2,433	3,415	2
7/15	2,966	6,381	3
7/16	1,809	8,190	4
7/17	7,568	15,758	8
7/18	1,892	17,650	9
7/19	1,419	19,069	9
7/21	1,419	20,488	10
7/22	473	20,961	10
7/24	1,419	22,380	10
7/25	1,419	23,799	11
7/27	1,419	25,218	12
8/3	1,419	26,637	13
8/8	1,419	28,056	14
8/12	473	28,529	14
8/21	85	28,614	14
8/28	75	28,689	14
9/6	25	28,714	14

* These figures represent the results of 205,000 green eggs seeded into incubator box.

** Less than 1 percent.

Origin of spawn - Power Creek Arm, Eyak Lake.

Destination of resultant fry - Power Creek Arm, Eyak Lake.

Table 8. Sockeye salmon fry lengths, Flemming Spit gravel incubator, 1974.

Date	Number in Sample	Average Length	Range	Total Length	Average Weight
7/29	50	27 mm	25-29mm	1357mm	
8/1	50	27.5mm	25-29mm	1374mm	
8/12	50	27 mm	24-30mm	1356mm	.22 gr.

Table 9. Sockeye salmon fry lengths, Eyak Lake gravel incubators, 1974.

Date	Number in Sample	Average Length	Range	Total Length	Average Weight
7/14	50	30 mm	27-32mm	1488mm	.28 gr.
7/14	50	30 mm	27-32mm	1492mm	.28 gr.
7/16	Box #1 Average weight for 10 fry .279 gr.				
7/16	Box #2 Average weight for 10 fry .281 gr.				
8/12	50	29 mm	26-32mm	1433mm	.26 gr.

1/ Measurement = tip of snout to tip of tail to the nearest millimeter.